1875MNRAS..36....1P

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OF THE

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Prof. J. C. Adams, F.R.S., President, in the Chair.

John Brise Colgrove, Esq., M.A., Rossall School, Fleetwood, was balloted for and duly elected a Fellow of the Society.

The University Observatory at Oxford. By the Rev. Prof. Pritchard.

It may be in the recollection of the Society that, exactly two years ago, I had the gratification of announcing the munificent intention of the University of Oxford to build and maintain an Observatory for researches connected with Astronomical Physics, and for the promotion of the study of the various branches of practical and philosophical astronomy among the members of the University. I have now the still further pleasure of communicating to the Society the completion of the undertaking in all its details.

With one exception, no great alteration has been made in the proposed construction of the building as detailed in the communication printed in the *Monthly Notices* of December 1873.

The exception referred to consists in the arrangements of the shutters in the revolving domes. The difficulties involved in the successful construction of such shutters is only too well known to astronomers, whether professional or amateur. It was publicly stated at a recent meeting of the Institute of British Architects by one of the most eminent and experienced

1875MNRAS..36....1P

of its members, and I believe the dictum had already been generally received among ourselves, that the astronomical necessity of an Observatory, and the æsthetic requirements of architecture, are incompatible; it was also added that ornamental crestings on the top of the revolving roofs were impossibilities. Happily the impossible problem has been solved at Oxford; and to Mr. Charles Barry must be assigned the honour, be it great or little, of having harmonised the claims of architecture with the necessities of practical astronomy.

The very ingenious attempt made by the Engineer (not the Architect) of the Oxford Observatory domes, to construct a flexible shutter of corrugated steel capable of being rolled up into a box, on experience failed entirely. Had this able engineer been spared to his profession, he would probably have succeeded on a further trial; but as it was, the difficult task of devising some practicable substitute devolved upon the Director of the Observatory. The problem was to devise a form of shutter which should be practically applicable to a revolving dome of handsome form, and that form neither hemispherical nor cylindrical.

After some consideration the solution of this problem turned out to be, as usual, something unexpectedly simple. The idea which suggested itself was to divide the shutters into three portions, *bending* them to the form of the dome (made approximately cylindrical at the opening or slip), and then sliding them up and down and over each other in their respective grooves, like the overlapping lights of a large greenhouse. The shutters, it was hoped, would be heavy enough to descend by their own weight, and each, or all of them together, could be drawn up into any required portion of the slit, and there maintained by ordinary sash-lines, winches, and lazy-pullies. This plan has been executed with perfect success; the system of shutters moves easily, causes no trouble, has proved perfectly watertight during the recent deluge of rains, and affords the means of excellent ventilation. The annexed Plate (reduced from an enlarged photograph now presented to the Society) of Mr. Charles Barry's design, will enable the members to form their own judgment as to the compatibility of elegant form with the necessities of an astronomical revolving roof.*

I now gladly turn to subjects of greater scientific interest, and probably more nearly touching the sympathy of the Royal Astronomical Society. Mr. Grubb's large equatoreal refractor proves, on experience, to be a very admirably constructed instrument. A photograph thereof shall be submitted to the judgment of

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* It should be understood that in the present instance, there were especial reasons for studying external appearance, on account of the beauty of the Park in which the University allowed the Observatory to be erected. A revolving roof of the usual form, either of a hemisphere or of a drum, would have been regarded as an intolerable disfigurement of the place.

1875MNRAS..36....3D

the Society at its next meeting. The object-glass is 12¼ inches clear aperture, and about 176 inches focal length: its optical qualities have been pronounced excellent by several competent judges who have examined its performance. The mounting of this large telescope has excited our admiration and our gratitude as often as we have had occasion to use it; its motion is steady and easy, and, when clamped, it is firm.

The contrivances for illuminating the divisions of the declination circle (of 30 inches diameter) and the field of view, the latter with either dark or bright wires, are ingenious and successful. The gas jet suspended from the extremity of the perforated declination circle, performs all this necessary work: it effectively illuminates also the position circle of nine inches diameter, which is permanently attached to the observing end of the telescope; alterations of intensity of light and colour are within the easy command of the observer.

The declination circle is read at the observing end by means of two long microscopes furnished with micrometer eye-pieces; while a third and contiguous long microscope, with a wide field as a rough reader, allows an easy method of setting the instrument in north polar distance. In the first instance, the flexure of the long microscope tubes (probably an inherent concomitant of such contrivance) proved an intolerable annoyance; but the defect has been effectually remedied by the attachment of a small platinum plate engraved with a fiducial line, which rotates with the tube of the telescope, closely to the plane of the divisions of the circle. Guided by our own experience, we can safely recommend this method in the future construction of very large instruments.

The clamping of the instrument in both elements is effectually made by means of a probably novel, and certainly very ingenious arrangement, of cylindrical male and female V-pieces, which are brought into contact by a small rod close to the observer's hand.

The driving clock does its work probably as well as any other existing clock; it is, comparatively, excellent, but not faultless. I am informed that Mr. Grubb has discovered a remedy of the defects by means of electrical connection with the normal clock of the Observatory, and that the experiment is now being made at Dr. Huggins's Observatory at Tulse Hill. If it there succeeds, we shall hope to adopt it at Oxford.

The contrivances for moving the telescope through small arcs while attached to the driving-clock, and for changing the rate for observations of the Moon, are perfectly satisfactory.

There are two subsidiary telescopes, of four inches, and two and a quarter inches, aperture respectively, attached to the tube. These we regard by no means in the light of mere finders, but each of them has its own illuminating apparatus, and each is adapted to all the micrometers and eye-pieces of the larger tube. The finder proper, when such aid happens to be required, consists of

1875MNRAS..36....3D

a pair of rifle-sights applied to the tube of the four-inch telescope.

There are three micrometers: two of them are filar micrometers, and the third is a double image micrometer by Troughton and Simms, and forms one out of the many generous gifts of Dr. De La Rue.

Finally, the instrument, independently of its many eye-pieces, whether solar or otherwise, is furnished with a Star spectroscope of unusual excellence by Mr. Grubb; a second, by Mr. Browning, is the gift of Dr. De La Rue; while the complement is completed by a Sun spectroscope admitting of the dispersion of either four prisms of sixty degrees, or of eight, or of twelve, at the desire of the observer. This latter powerful but simple instrument, by Grubb, I hope to submit to the inspection of the Society at its next meeting.

The devising and construction of an efficient observing chair always occasions some trouble and anxiety. I have myself adopted the simple idea of a set of five steps, some forty-two inches wide, terminating with a rather broad platform and rails at the top: the whole moves on large castors, and can be pushed into any required position with the finger. Various cushions and hassocks lie on the steps of this machine, in order to vary by slight degrees the height of the observers as they sit to their work: I say observers, because it is sometimes of advantage, and to us often so, for two observers to work simultaneously on the same phenomenon with two telescopes of different apertures.

The refracting telescope, with its appendages thus described, occupies the larger or western dome. The eastern, or De La Rue dome, contains that gentleman's munificent gift to the University, and we can only hope it may be destined to effect some work worthy of its former reputation. Both these domes rotate on a simple adaptation of Smeaton's line ring. A child may easily turn either of them.

The annex between the two domes is divided into two portions: they contain one of Dr. De La Rue's large reflectors mounted as an altazimuth, with a small motion near the meridian, a five-feet transit instrument, and three smaller instruments mounted on their stone pedestals, and intended for educational purposes among the members of the University.

The rooms under the two dome rooms already described are devoted to a computing room, a private room for the Director, and a photographic room together with its dark chamber. A somewhat lofty basement underlies all these rooms, and the whole building is lighted with gas. In one of the compartments of the basement there are placed Dr. De La Rue's polishing machine for telescope mirrors, and Foucault's apparatus for testing their figures.

I need scarcely repeat that the Observatory and its instruments are not designed so much for meridional observations as for re-

1875MNRAS..36....5D

searches connected with what may properly be termed Astronomical Physics.

Nevertheless, we are at all times prepared to devote the large apertures of the instruments to any desirable purposes to which they appear adapted: and although the Observatory has only been finally completed in all its details within the last few days, a considerable set of observations of six of the satellites of Saturn have been taken, which we trust will prove of some value, and will shortly be communicated to the Society.

In concluding the description of these really noble specimens of astronomical engineering, I cannot refrain from recording my admiration of the admirable manner in which Mr. Grubb has much more than merely fulfilled his contract with the University of Oxford. It has been one among many other happy results of the removal of ancient fiscal misarrangements, that English opticians have at length overtaken their eminent brother artists on the Continent. It is not now so much to Munich that it is necessary to resort for our largest and most perfect instruments; but gigantic observatories and colossal telescopes are at this moment in course of construction in the workshops of Dublin, intended to promote astronomical research in some of the chief cities of Continental Europe.

I may also, I trust, be pardoned for repeating a remark which I believe I have made in this Society before, to the effect that the artists and constructors of these admirable astronomical machines—admirable alike for their ponderous stability, for the smoothness of their motion, and for their adaptation to the most minute delicacy of accurate measurements—claim at our hands a meed of gratitude and honour scarcely if at all less than that which we so gladly accord to the illustrious astronomers who so successfully avail themselves of the mechanician's skill. And all honour be also paid to the enlightened munificence of the University of Oxford, who, notwithstanding their comparatively limited pecuniary resources, and the vast and ever-increasing variety of claims that are made upon them, have devoted so much encouragement and so considerable a sum to the cultivation of the science which so deeply engages our own sympathies. Dr. De La Rue also may be congratulated on the hitherto successful arrangements to which his own generosity gave the first impulse.

On the Preparations which are being made on the Continent for promoting Physico-Astronomical Observations. By Warren de La Rue, D.C.L., F.R.S.

It is scarcely necessary for me to tell the Fellows of the Royal Astronomical Society that their favourite branch of our science, namely, the Physics of Astronomy, is now engaging the earnest attention of foreign professional astronomers to a greater extent than obtained only a few years ago, and that grand preparations